TABLE 4-continued

Status at time = 1536T_c

correlator no.	status	new index value	corresponding delay	new value in next location register
4	fail threshold	7	–18	7½
5	fail threshold	7½	–17½	8
6	continue (2nd)	1½	–23½	8
7	fail threshold	8	–17	8½
8	pass threshold	5½	–19½	8½

Note: Correlator 8, which has passed the first dwell threshold, and correlators 3 and 6, which are correlating in the second dwell time, are kept at their old delays. The other correlators are set to the next delays.

TABLE 5

Status at time = 2048T_c

correlator no.	status	new index value	corresponding delay	new value in next location register
1	fail threshold	8½	–16½	9
2	pass threshold	6½	–18½	9
3	continue (3rd)	0	–35	9
4	fail threshold	9	–16	9½
5	fail threshold	9½	–15½	10
6	continue (3rd)	1½	–23½	10
7	fail threshold	10	–15	10½
8	continue (2nd)	5½	–19½	10½

Note: Correlator 2, which has passed the first dwell threshold, and correlators 3, 6 and 8, which are correlating in the second dwell time, are kept at their old delays. The other correlators are set to the next delays.

An interrupt is again generated, but no hold is performed because the earliest correlator still is correlator 3.

TABLE 6

Status at time = 2560T_c

correlator no.	status	new index value	corresponding delay	new value in next location register
1	fail threshold	10½	–14½	11
2	continue (2nd)e	6½	–18½	11
3	finish (new location)	11	–14	11½
4	fail threshold	11½	–13½	12
5	fail threshold	12	–13	12½
6	finish (new location)	12½	–12½	13
7	fail threshold	13	–12	13½
8	continue (3rd)	5½	–19½	10½

Note: Correlators 2 and 8, which are correlating in the second dwell time, remain at their old delays. The other correlators, which either have failed the first dwell threshold or have completed the full first and second dwell correlations, are set to the next delays. In correlators 3 and 6, the active memory registers now store S_{2e}, the second dwell correlation value.

TABLE 7

Status at time = 3072T_c

correlator no.	status	new index value	corresponding delay	new value in next location register
1	fail threshold	13½	–11½	14
2	continue (3rd)	6½	–18½	13
3	fail threshold	14	–11	14½

TABLE 7-continued

Status at time = 3077T_c

correlator no.	status	new index value	corresponding delay	new value in next location register
4	pass threshold	13½	–13½	14½
5	fail threshold	14½	–10½	15
6	pass threshold	12½	–13½	15
7	fail threshold	15	–10	15½
8	finish (new location)	15½	–9½	16

An interrupt is again generated. S_{3e} is read from the inactive complex registers of the memories of correlators 3 and 6. The corresponding indices are read from the corresponding integer registers of the memories of correlators 3 and 6. Hold unit 26 performs a hold of δ_c because the earliest correlator (correlator 2) is advanced by $13T_c/2$ relative to PN sequence generator 12. Correspondingly, 6 is subtracted from all of the index values and from the value in the next location register.

The operations performed by searcher 10 are partitioned between hardware and software in a manner that makes optimal use of the relative strengths and weaknesses of hardware and software. Specifically, operations associated with high current consumption are implemented in hardware, and numerically intensive operations are implemented in software. The exceptions are numerically intensive operations that are performed frequently, for example, the approximate computation of $|S_{xk}|$ according to equation (9), which also are performed in hardware. The sorting of S_{xk} values to find the test delays that pass the second dwell threshold, and the pausing of PN generator 12, also are done by software.

While the invention has been described with respect to a limited number of embodiments, it will be appreciated that many variations, modifications and other applications of the invention may be made.

What is claimed is:

1. A cellular telephony searcher, comprising:

a plurality of correlators for correlating a received signal with a pseudonoise sequence;

an input mechanism for inputting said pseudonoise sequence into said correlators, each of said correlators receiving said pseudonoise sequence with a different delay; and

a delay management mechanism for initializing said delays and subsequently changing said delays, said changing being contingent, for each said correlator, only on an output of said each correlator.

2. The searcher of claim 1, wherein each said correlator correlates said received signal with said pseudonoise sequence at said respective delay for a correlation time selected from the group consisting of a first dwell time and a sum of said first dwell time and a second dwell time, said selection being performed separately for each said correlator.

3. The searcher of claim 1, wherein, for each said correlator, said delay management mechanism changes said delay corresponding to said each correlator if an estimated absolute value of said output of said each correlator is less than a threshold common to all said correlators, independent of an estimated absolute value of said output of any other said correlator.

4. The searcher of claim 1, wherein said input mechanism includes:

a pseudonoise sequence generator for generating said pseudonoise sequence; and

a delay line for receiving said pseudonoise sequence and outputting a plurality of copies of said pseudonoise sequence, each said copy being outputted with a different said delay.

5. The searcher of claim 4, wherein said delay management mechanism includes:

for each said correlator, an index register; and

a multiplexer for directing one of said copies of said pseudonoise sequence to each said correlator in accordance with an index value stored in said index register of said each correlator.

6. In a cellular telephony network including at least one base station and at least one mobile station, each of the at least one mobile station receiving a received signal from the at least one base station, the received signal including a plurality of received values, each said received value having a real part and an imaginary part, a method for each of the at least one mobile station to identify at least one multipath channel to use to communicate with one of the at least one base station, comprising:

generating a pseudonoise sequence;

simultaneously performing a plurality of initial correlations of the received signal with said pseudonoise sequence, each of said initial correlations being performed with a different initial delay of said pseudonoise sequence, said initial correlations being performed for a first dwell time to produce, for each of said initial correlations, an initial first dwell time correlation value; and

for each said initial correlation:

if an estimated absolute value of said initial first dwell time correlation value exceeds a threshold, continuing to perform said each initial correlation,

otherwise, performing a first subsequent correlation of the received signal with said pseudonoise sequence at a first subsequent delay different from any of said initial delays;

wherein, if said performing of at least one of said initial correlations is continued and if at least one of said first subsequent correlations is performed, said continued performing of said at least one initial correlation and said performing of said at least one first subsequent correlation are effected simultaneously.

7. The method of claim 6, wherein, if a plurality of said first subsequent correlations are performed, said first subsequent delays all are mutually different.

8. The method of claim 6, wherein said continued performing of said initial correlations is effected for a second dwell time to produce a second dwell time correlation value.

9. The method of claim 8, wherein said second dwell time is an integral multiple of said first dwell time.

10. The method of claim 6, wherein successive said initial delays differ by a common increment.

11. The method of claim 10, wherein said pseudoooise sequence includes a plurality of chips geoerated at a certain chip interval, and wherein said common increment is ao integral fraction of said chip interval.

12. The method of claim 6, wherein said first subsequent correlations are performed for said first dwell time to produce, for each of said first subsequent correlations, a subsequent first dwell time correlation value, the method further comprising:

for each said first subsequent correlation:

if an estimated absolute value of said subsequent first dwell time correlation value exceeds a threshold, continuing to perform said each first subsequent correlation;

otherwise, performing a second subsequent correlation of the received signal with said pseudonoise sequence at a second subsequent delay different from any of said initial delays and from any of said first subsequent delays.

13. The method of claim 12, wherein, if said performing of at least one continued correlation, selected from the group consisting of said initial correlations and said first subsequent correlations, is continued, and if at least one of said second subsequent correlations is performed, said continued performing of said at least one continued correlation and said performing of said at least one second subsequent correlation are effected simultaneously.

14. The method of claim 6, further comprising:

if, after said simultaneous initial correlations are completed up to said first dwell time, all of said delays, whereat said initial correlations are continued and whereat said first subsequent correlations are performed, exceed a shortest initial delay, pausing said generating of said pseudonoise sequence.

15. The method of claim 14, wherein said pausing of said generating of said pseudonoise sequence is effected for a difference between a shortest said delay, whereat said initial correlations are continued and whereat said first subsequent correlations are performed, and said shortest initial delay.

16. The method of claim 6, wherein said correlations are performed using only arithmetical operations selected from the group consisting of additions and subtractions.

17. The method of claim 16, wherein each said correlation is performed as a sum of a plurality of terms, each said term being selected from the group consisting of the real part of a corresponding received value, a negative of the real part of said corresponding received value, the imaginary part of said corresponding received value, and a negative of the imaginary part of said corresponding received value.

18. The method of claim 16, further comprising:

normalizing said correlations.

19. The method of claim 16, wherein each said correlation is performed as a sum of a plurality of terms, each said term being selected from the group consisting of a sum of the real part of a corresponding received value and the imagioary part of said corresponding received value, a negative of said sum of the real part of said corresponding received value and the imaginary part of said corresponding received value, a difference of the real part of said corresponding received value and the imaginary part of said corresponding received value, and a negative of said difference of the real part of said corresponding received value and the imaginary part of said corresponding received value.

20. The method of claim 6, further comprising:

rotating said pseudonoise sequence by 45° prior to performing said correlations.

21. The method of claim 20, further comprising:

normalizing said correlations.

22. The method of claim 6, wherein said estimated absolute value of said initial first dwell time correlation value is a piecewise linear approximation of an exact absolute value of said initial first dwell time correlation value.

23. The method of claim 22, wherein said piecewise linear approximation is a piecewise linear combination of a lager of an absolute value of a real part of said initial first dwell time and an imaginary part of said initial first dwell time with a smaller of said absolute value of said real part of said initial first dwell time and said absolute value of said imaginary part of said initial first dwell time.

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